



Taming a Minsky Cycle

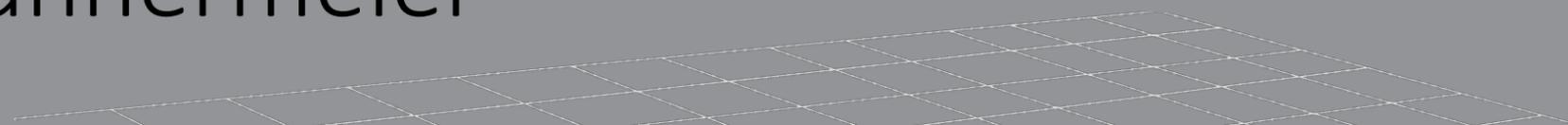
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with Emmanuel Farhi

MIT

11. March 2021

Markus Brunnermeier

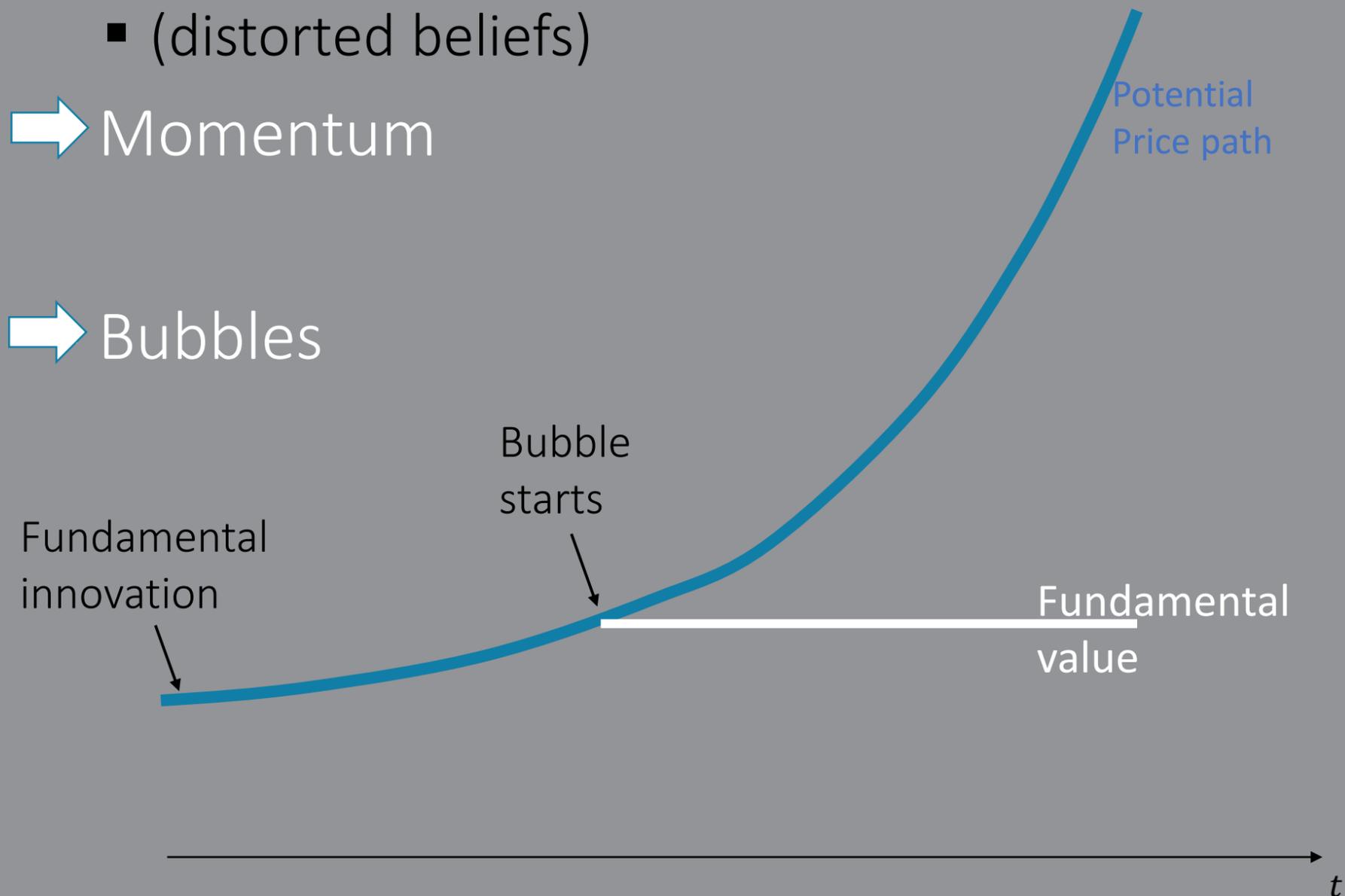


Extrapolative Expectations & Bubbles

- Extrapolative expectations (adapted expectations in growth)
 - E.g. Gennaioli & Shleifer book
 - (distorted beliefs)

➔ Momentum

➔ Bubbles



Good vs. bad bubbles

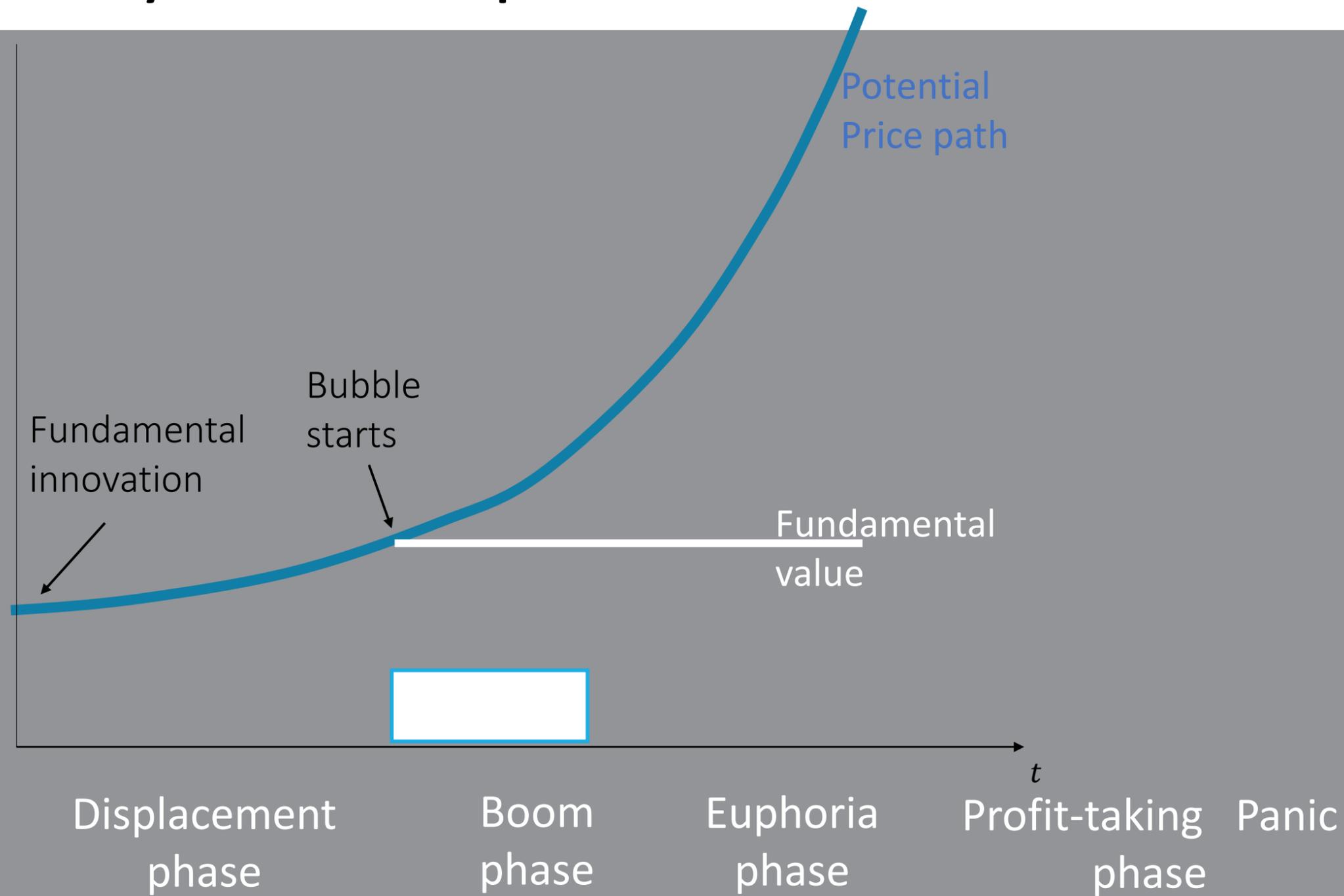
- New technologies and R&D investments (1998-2000)
 - Overcoming QWERTY (chicken-egg) problems
- Safe Asset as a bubble (government debt $r < g$)
 - Serves as precautionary savings tool
 - Asset Price = $E[\text{PV}(\text{cash flows})] + E[\text{PV}(\text{service flows})]$
 - dividends/interest $\beta^{cf} > 0$
 - insurance via re-trading $\beta^{sf} < 0$
 - 2 β s
 - Debt as Safe Asset
Brunnermeier-Merkel-Sannikov 2020
- Real estate bubbles (2006)
- Financial innovation/liberalization bubbles
- BITCOIN

Harmless vs. Dangerous Bubbles – how to fight?

- Equity financed bubbles (1998-2000)
- Credit financed bubbles (2005-2006)
 - Minsky's financing classification
 - Hedge borrowing: can pay off whole debt
 - Speculative borrowing: can pay off interest due
 - Ponzi financing

1. Policy makers should “fight” bubbles by
 - a. Leaning against during build-up
 - b. Clean afterwards only
2. Policy makers should “fight” bubbles
 - a. with monetary policy
 - b. primarily with macro-prudential tools
 - c. both

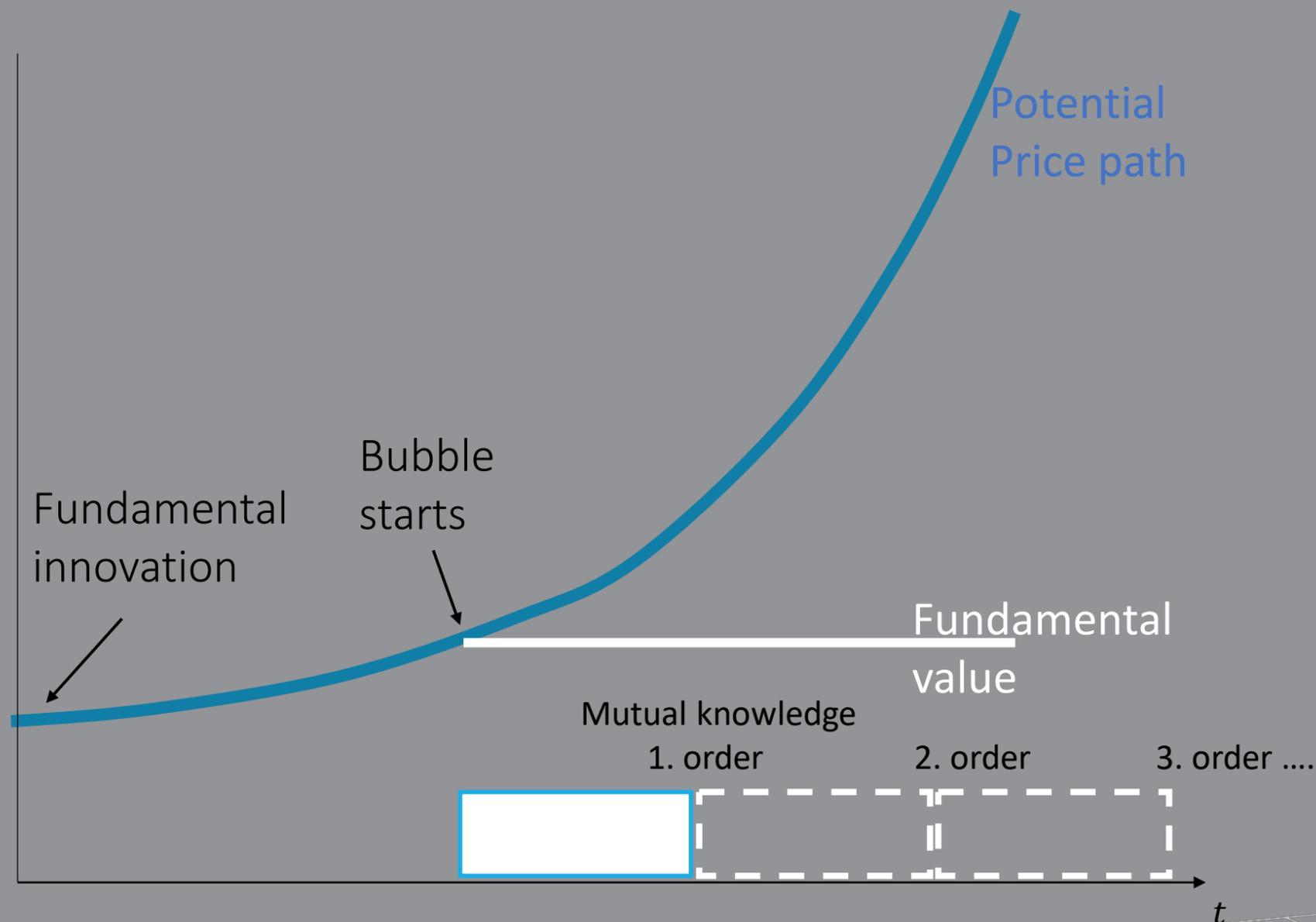
Minsky's bubble phases



Why do **rational investor ride** rather than attack bubbles?

- Co-opetition among rational investors
 - Competition: exit bubble before it bursts
 - Cooperation: ride as long as other ride it

Sequential awareness/learning + critical mass
Kills **backwards induction** argument
common knowledge of bubble



Poll Questions

1. Policy makers should “fight” bubbles by
 - a. Leaning against during build-up
 - b. Clean afterwards only

2. Policy makers should “fight” bubbles
 - a. with monetary policy
 - b. primarily with macro-prudential tools
 - c. both

3. Policy makers’ belief distortions and exuberance are
 - a. smaller than the markets’
 - b. about the same
 - c. Larger than the markets’

Taming a Minsky Cycle

Emmanuel Farhi

Iván Werning

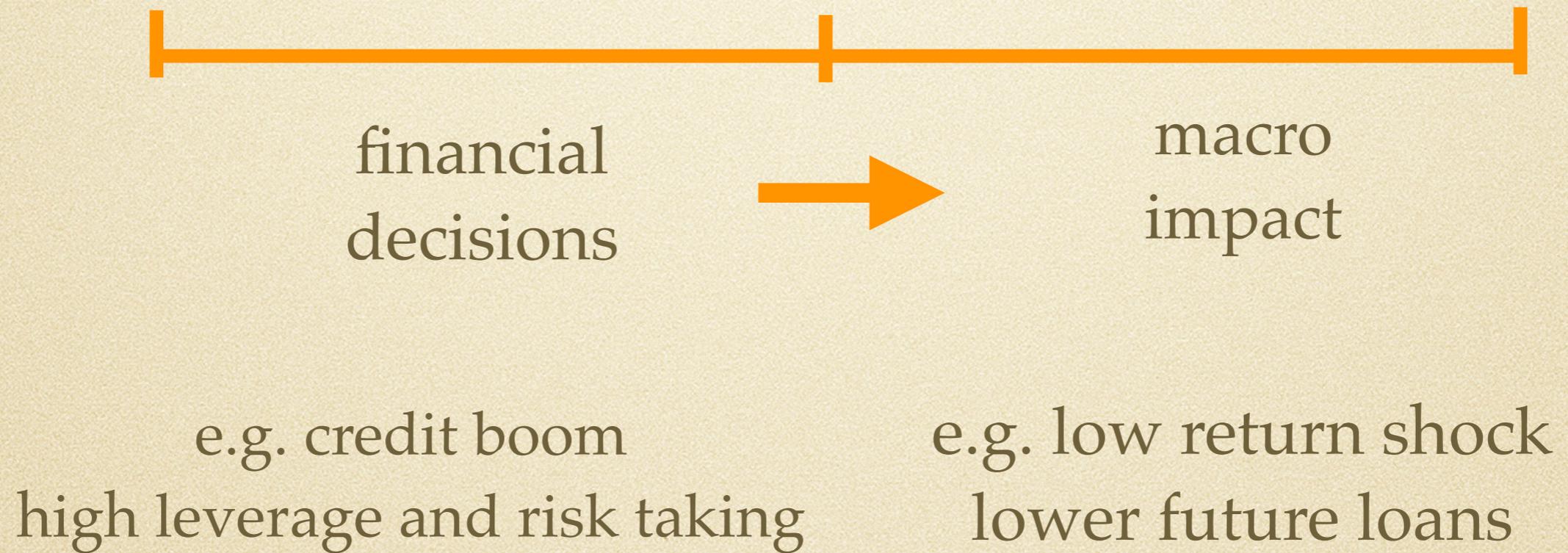
March 2020

Markus Academy, Princeton

Macroprudential Policy

- Macroprudential policies motivation...
 - financial fragility
 - *aggregate demand* stabilization
 - monetary policy constraints or dilemmas
- Open economy: capital flows, dilemma
- Farhi-Werning (2013, 2014, 2016)...
 - Applications: capital controls, fiscal unions, deleveraging
 - General model: pecuniary + demand externalities
 - Formula: MPCs + Wedges (Econometrica 2016)
- New Today... “Taming a Minsky Cycle” (2020)
 - Minsky Boom Bust Cycles
 - Boom: complacency, rising asset prices and leverage
 - Bust: “Minsky moment”, risk repricing, deleveraging
 - Non-rational expectations, extrapolation

Macprudential



Macprudential

macropru regulation



financial
decisions



macro
impact

e.g. credit boom
high leverage and risk taking

e.g. low return shock
lower future loans

Macroprudential

macropru regulation



financial
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e.g. credit boom
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lower future loans

Is there a market failure?

Not necessarily.

Externality needed.

Macprudential

monetary policy?

macropru regulation



financial
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financial
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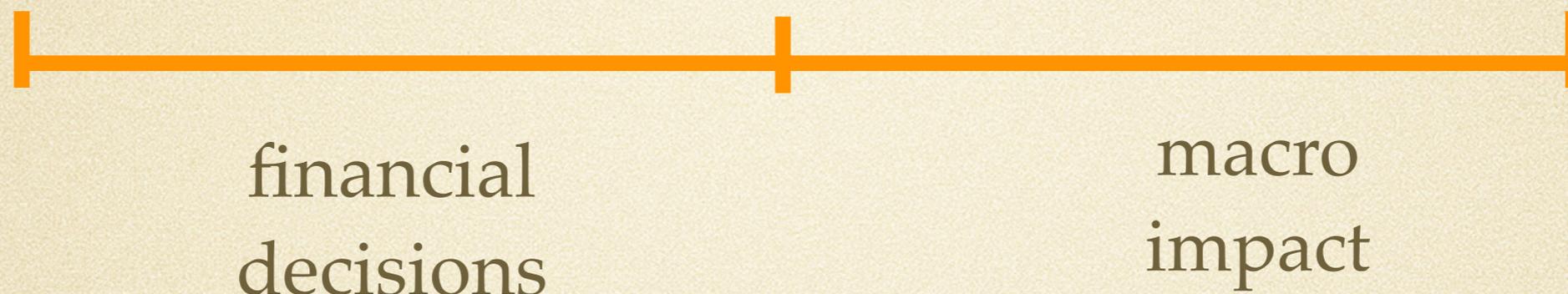
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Macprudential

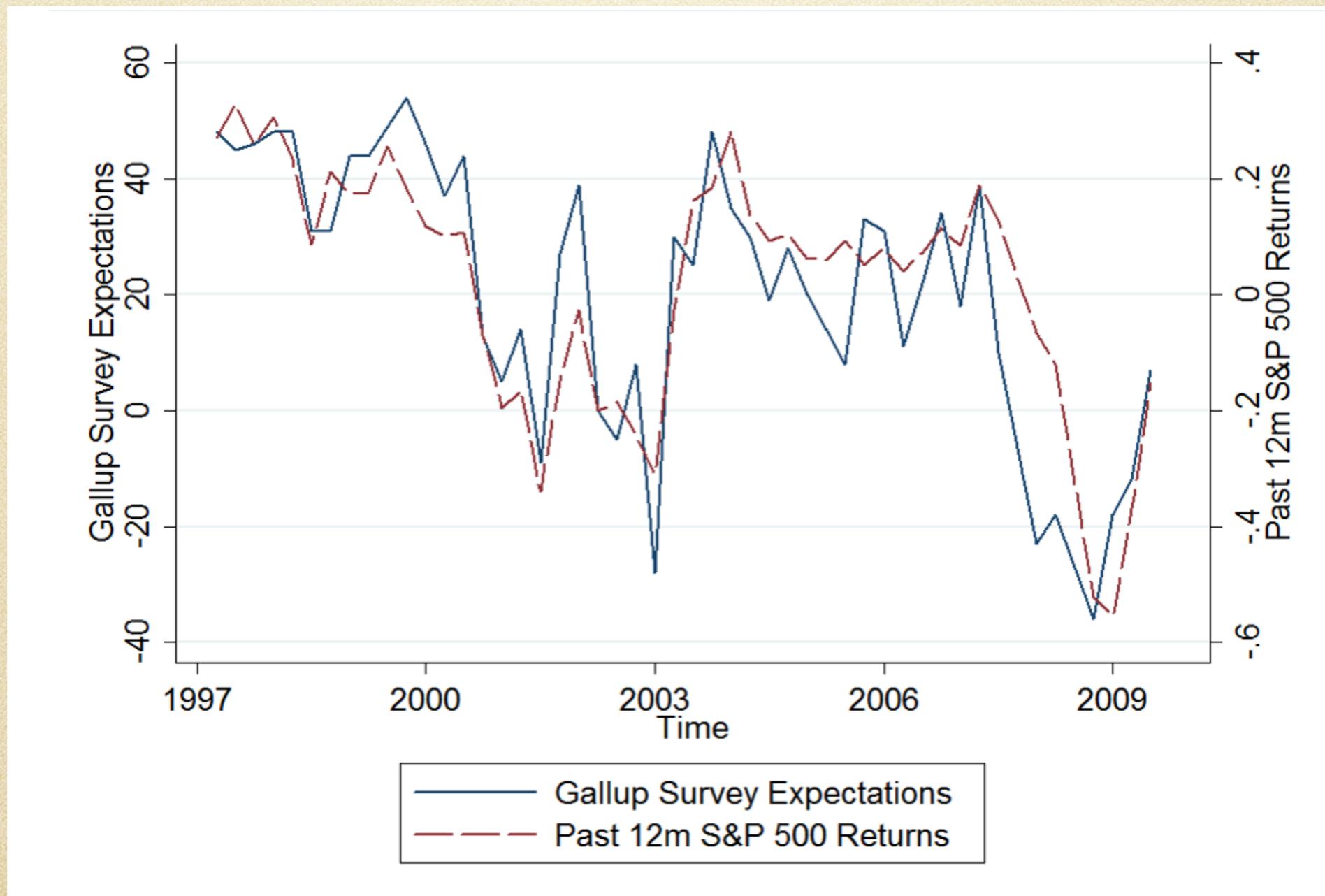


$$\text{tax on asset}_i \text{ held by } j = \sum_{\text{good}} \text{wedge}_{\text{good}} \times \text{MPC}_{\text{good}}^j$$

- Macprud formula: linked to MPCs and wedges
- General model: incomplete markets, financial constraints with prices etc. (pecuniary externalities)

Extrapolative Expectations

- Greenwood-Sheifer (2014): survey of investor expectations of future stock returns correlate with past returns and level of stock market



Policies to Tame a Minsky Cycle

- Elements today...
 - Monetary with and without macro-pru
 - Macroeconomic vs. financial stabilitys
 - Targets and instruments a la Tinbergen
 - trading off targets with given instruments
 - assignment of targets to instruments
 - Key role of endogeneity of beliefs

Minsky

- Unhappy with neoclassical synthesis;
 - important aspects of Keynes
 - but missing financial / investment
 - too rosy on stability prospects
- Ideas...
 - system is *endogenously* unstable...
 - ... perfect stabilization with money and fiscal policy: impossible
 - tranquility, seeds the risk taking, that creates boom / bust
 - financial markets different than real economy; debt financing during expansion, turns more speculative

Minsky in “Stabilizing an Unstable Economy”

- Boom and role of expectation feedback...

“Instability emerges as a period of relative tranquil growth is transformed into a **speculative boom** [...] **middlemen in finance change in response to the success of the economy.**”

“unless the past is being validated [...] none but pathological optimists will invest.”

“A **rise in the price** of financial instruments or capital assets **may very well increase the quantity demanded** [...] thus breed conditions conducive to another such rise.”

- Policy implications for financial controls...

“We need a Theory that makes instability a normal result in our economy and gives us **handles to control** it.”

“External controls and coordinating mechanisms may be needed in a capitalist economy. Indeed, central banking and other **financial control devices** arose as a response to the embarrassing incoherence of financial markets.”

“It is possible that with other **institutional organizations** and policy systems the susceptibility of our economy to financial crises can be lower than at present”

Related Literature

- **Monetary Policy:** Woodford, Gali, Werning, Eggertson-Krugman, McKay-Nakamura-Steinsson, Auclert; ...
- **Monetary Policy and Expectations:** Farhi-Werning; Angeletos-Lian; Gabaix...
- **Macroprudential Policy:** Farhi-Werning, Korinek-Simsek, Caballero-Simsek, Bianchi-Mendoza...
- **Extrapolative / Diagnostic Expectations:** Bordalo-Gennaioli-Shleifer, Maxted ...



	Monetary	Monetary + Macroprou
Rational Expectation		

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Rational Expectation	IT	

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Extrapolative Expectations		

	Monetary	Monetary + Macroprou
Rational Expectation	IT	IT + Macroprou
Extrapolative Expectations	Lean Against Boom	

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Model Ingredients

- He-Krishnamurthy (2013) (Brunnermeier-Sannikov, 2014)
 - asset pricing model
 - adds nominal rigidities + optimal policy
- Incomplete markets...
 - risky asset (Lucas tree)
 - risk-free short-term bond
- Two agents...
 - savers: save risk-free
 - borrowers:
 - invest in risky asset
 - borrow risk-free
- Three periods $t=0,1,2$
- Consumption good produced 1-to-1 with labor
- Rigid wages, no inflation

Demand Determined Output
(rigid wage)

Endowment

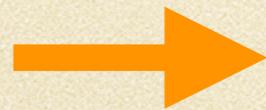
$t = 0$

$t = 1$

$t = 2$



borrowing
& investing



ZLB binds

risky return
realized

Periods, States and Demographics

- Three periods $t \in \{0,1,2\}$
- Aggregate state $\omega \in \{H,L\}$
- Determines dividend $D_{2,\omega}$ of Lucas tree with
 $D_{2,H} > D_{2,L}$
- Agents $i \in \{S,B\}$ share ϕ^i

Preferences and Technology

- Technology

- $t = 0, 1$ $\phi^S c_t^S + \phi^B c_t^B \leq Y_t = \phi^S l_t^S$

- $t = 2$ $\phi^S c_{2,\omega}^S + \phi^B c_{2,\omega}^B \leq Y_{2,\omega} = D_{2,\omega}$

- Preferences

- Borrowers

$$(1 - \beta_0)[\log c_0^S - h(l_0^S)] + \beta_0(1 - \beta_1)[\log c_1^S - h(l_1^S)] + \beta_0\beta_1\mathbb{E}[\log c_2^S]$$

- Savers

$$(1 - \beta_0) \log c_0^B + \beta_0(1 - \beta_1) \log c_1^B + \beta_0\beta_1\mathbb{E}[\log c_2^B]$$

Nominal Rigidities

- Sticky wages normalized to one
- Zero Lower Bound (ZLB) binds at $t=1$, not at $t=0$

Budget Constraints

Savers

$$c_0^S + \frac{b_1^S}{R_0} - b_0^S - l_0^S - t_0^S \leq 0 \quad \text{with} \quad l_0^S = \frac{Y_0}{\phi^S}$$

$$c_1^S + \frac{b_2^S}{R_1} - b_1^S - l_1^S \leq 0 \quad \text{with} \quad l_1^S = \frac{Y_1}{\phi^S}$$

$$c_{2,\omega}^S - b_2^S \leq 0$$

Borrowers

$$c_0^B + \frac{b_1^B}{R_0} (1 - \tau_0) - b_0^B + (x_1^B - \frac{1}{\phi^B}) P_0 - t_0^B \leq 0$$

$$c_1^B + \frac{b_2^B}{R_1} - b_1^B + (x_2^B - x_1^B) P_1 \leq 0$$

$$c_{2,\omega}^B - b_2^B - x_2^B D_{2,\omega} \leq 0$$

Labor Wedges and Output Gaps

- Labor Wedges

$$\mu_t = 1 - c_t^S h'(l_0^S)$$

- Positive wedges iff negative output gap
- “Macroeconomic Stability”

Debt as a State Variable

- Savings of savers b_1^S (debt of borrowers) state variable at $t=1$
- Asset price and output...

$$P_1(b_1^S) = \frac{\beta_1}{1 - \beta_1} Y_1(b_1^S)$$

Debt as a State Variable

- Savings of savers b_1^S (debt of borrowers) state variable at $t=1$
- Asset price and output...

$$P_1(b_1^S) = \frac{\beta_1}{1 - \beta_1} Y_1(b_1^S)$$

- Financial Fragility: two intuitions...
 - higher debt → lower risk-taking capacity
 - higher risk premia → lower asset price
 - lower consumption
 - higher debt → higher precautionary motive
 - lower natural rate lower consumption
- Risk always key here; without it, no effect.

Value Functions and AD Externalities

- Allocation pinned down by b_1^S
- Value functions $V^S(b_1^S)$ and $V^B(b_1^S)$
- Aggregate demand externality if recession at $t=1$
(compare MRS of planner to agents')

$$-\frac{\lambda^S \phi^S \frac{dV^S}{db_1^S}}{\lambda^B \phi^B \frac{dV^B}{db_1^S}} = \frac{\lambda^S c_1^B}{\lambda^B c_1^S} \left(1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right) < \frac{\lambda^S c_1^B}{\lambda^B c_1^S}$$

Externality

Social Marginal Utilities \neq Private Marginal Utilities

Monetary Policy

- Focus on Pareto weights that neutralize distributive objectives ($\lambda^S/\lambda^B = c_0^S/c_0^B$)
- Optimal monetary policy targeting rule

$$\mu_0 = \left(\frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right) \left(\frac{\phi^S \frac{db_1^S}{dR_0}}{-R_0 \frac{dY_0}{dR_0}} \right), \quad \text{with} \quad \frac{db_1^S}{dR_0} = \frac{\beta_0 b_0^S}{1 - \frac{\beta_1(1-\beta_0)}{1-\beta_1} \frac{1}{\phi^S} \frac{dY_1}{db_1^S}}$$

- Lean against boom ($\mu_0 < 0$) iff borrowers initially levered ($b_0^S > 0$)
- Benchmark with $b_0^S = 0$ gives standard “inflation targeting” (IT)

	Monetary	Monetary + Macroprou
Rational Expectation	IT	
Extrapolative Expectations		

Monetary Policy and Macropolicy

- Optimal monetary policy targeting rule

$$\mu_0 = 0$$

- Macropprudential tax on borrower leverage

$$1 - \tau_0 = \left(1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right) \quad \text{or equivalently} \quad \tau_0 = -\frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} > 0$$

- Assignment of targets to instruments:
 - macro stability to monetary policy
 - financial stability to macropprudential policy

	Monetary	Monetary + Macroprou
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Extrapolative Expectations		

Extrapolative Expectations

- Introduce extrapolative expectations by borrowers

$$\frac{P_1^e}{P_0} = (1 - \rho) \frac{P_1}{P_0} + \rho \frac{P_0}{P_{-1}}$$

- Modeled by either...
 - wedge in investor Euler equation or
 - subjective probabilities

AD and Belief Externalities

- AD and Belief Externalities

$$-\frac{\lambda^S \phi^S \frac{dV^S}{db_1^S}}{\lambda^B \phi^B \frac{dV^B}{db_1^S}} = \frac{\lambda^S c_1^{B,e}}{\lambda^B c_1^S} \left(\frac{c_1^B}{c_1^{B,e}} \right) \left(1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right)$$

- Belief externalities reinforce AD externalities as long as borrowers are optimistic ($c_1^{B,e} > c_1^B$) in equilibrium
- This will be the case.

Monetary Policy

- Optimal Monetary Policy targeting rule

$$\mu_0 = \left(\left(\frac{c_1^B}{c_1^{B,e}} \right) \left(1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right) - 1 \right) \left(\frac{(1 - \beta_1) \phi^S \frac{c_1^{B,e}}{c_1^B} \frac{db_1^S}{dR_0}}{-R_0 \frac{dY_0}{dR_0}} \right)$$

$$\frac{db_1^S}{dR_0} = \frac{\beta_0 b_0^S + (1 - \beta_0) \frac{\rho}{\phi^S} \frac{2P_0}{P_{-1}} \frac{\partial P_0}{\partial R_0}}{1 - (1 - \beta_0) \left(\frac{1 - \rho}{\phi^S} \frac{\beta_1}{1 - \beta_1} \frac{dY_1}{db_1^S} + \frac{\rho}{\phi^S} \frac{2P_0}{P_{-1}} \frac{\partial P_0}{\partial b_1^S} \right)}$$

- Lean against boom ($\mu_0 < 0$) if extrapolative expectations

Intuition

- “Take the punch bowl away when the party is still going”
- Contractionary Monetary Policy...
 - cools economy during boom
 - cools expectations of returns
 - cools borrowing
 - low borrowing beneficial in future
- Extrapolative expectations important

	Monetary	Monetary + Macropru
Rational Expectation	IT	IT + Macropru
Extrapolative Expectations	Lean against Boom	?

Monetary+Macropru

- Optimal monetary policy **again...**

$$\mu_0 = 0$$

- Macropru tax borrower leverage

$$1 - \tau_0 = \left(\frac{c_1^B}{c_1^{B,e}} \right) \left(1 + \frac{\mu_1}{\phi^S} \frac{dY_1}{db_1^S} \right)$$

- Assignment of targets to instruments
 - monetary: macro stability
 - financial stability: macropru

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Extrapolative Expectations During Bust

- Before: only extrapolative during $t = 0$;
rationality kicks in at $t = 1$ (“Minsky moment”)
- Now: extrapolative also during bust
- Two state variables...
 - leverage (as before)
 - beliefs affected by past asset prices (new)
- Two-dimensional financial stability
 - monetary policy alone: additional reason to lean against the wind at $t = 0$...
 - ...remains true with macropru policy

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**Extrapolation
during Bust:
Lean Against
Boom**

Conclusion

- General theory of macropru + monetary policy
 - workhorse for many applications
 - general formula: MPCs and wedges
- Minsky Cycles with non-Rational Expectations
 - expectation management: interventions attempt to mitigate financial crashes in prices
 - dilemma: may affect monetary policy
 - modifies optimal policy responses (targets and instruments)